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# IEEE Standard Requirements for the Control of Electromagnetic Interference Characteristics of Replaceable Electronic Modules

IEEE Electromagnetic Compatibility Society

Sponsored by the
Standards Development Committee

IEEE
3 Park Avenue
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USA

IEEE Std 1688™-2015

# IEEE Standard Requirements for the Control of Electromagnetic Interference Characteristics of Replaceable Electronic Modules

Sponsor

**Standards Development Committee**
of the
**IEEE Electromagnetic Compatibility Society**

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**Abstract:** Electromagnetic performance requirements for replaceable electronic modules (REMs) are specified. This standard is suitable for items that have the following features: removable/replaceable electronic circuit modules that plug into an equipment rack or frame, with electrical interconnections primarily through edge connectors that interface directly with a backplane, and electrical power input derived from the backplane power sources. This standard is based on MIL-STD-461E system/equipment level electromagnetic interference (EMI) controls. The conducted and radiated requirements, limits, and test methods were adapted to provide risk reduction of REM EMI before integration in a system/equipment.

**Keywords:** electromagnetic compatibility, electromagnetic emission, electromagnetic interference, electromagnetic susceptibility, electrostatic discharge, EMC, EMI, ESD, IEEE 1688™, REM, replaceable electronic module, test limits

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA



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**Frederick Heather**, *Chair*
**Kanaiya Mahendra**, *Vice Chair*

Dennis Barberi
Stu Benner
Robert Berkovitz
John Birkland
Ron Brewer
David Brumbaugh
Joe Calabria
Paul Emery
H. R. (Bob) Hofmann
Doug Howard
Howard Jordan
Matt Juszczyk
Cathy Lewis
Fin O'Connor
Jack Parwica
Beverly Persons
Kermit Phipps
Jacques Rollin
Jack Sargeant
Noel Sargent
Walter Scott
Dale Svetanoff
Donald Sweeney
Joe Tannehill
Tesfahunei Tec[illegible]
Richard Wo[illegible]

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

Bill Brown
William Bush
Suresh Channarasappa
Keith Chow
Ernest Duckworth
Alistair Duffy
Randall Groves
Donald Heirman
Werner Hoelzl
Daniel Hoolihan
Sergiu Iordanescu
Yuri Khersonsky
Chad Kiger
Joseph L. Koepfinger
George Kyle
Arthur H. Light
Greg Luri
Edward Mccall
Michael Newman
Charles Ngethe
David Nicho[illegible]
Bansi Pat[illegible]
Ronald Petersen
Gh[illegible]ettu
Michael Roberts
Jack Sargeant
Bartien Sayogo
Thomas Starai
Walter Struppler
Donald Sweeney
Shinji Tanabe
David Tarrant
Thomas Tullia
John Vergis
Barry Wallen
Daidi Zhong

When the IEEE-SA Standar[illegible] Board approved this standard on 11 June 2015, it had the following membership:

**John Kulick**, *Chair*
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**Richard H. Hulett**, *Past Chair*
**Konstantinos Karachalios**, *Secretary*

Peter Ba[illegible]ma
[illegible]rooq[illegible]ri
Ted Burse
[illegible]int Chaplain
Stephen Dukes
Jean-Phillippe Faure
Gary Hoffman
Michael Janezic
Jeffrey Katz
Joseph L. Koepfinger*
David J. Law
Hung Ling
Oleg Logvinov
Ted Olsen
Glenn Parsons
Ron Peterson
Adrian Stephens
Peter Sutherland
Yatin Trivedi
Phil Winston
Don Wright
Yu Yuan

*Member Emeritus

## Introduction

This introduction is not part of IEEE Std 1688-2015, IEEE Standard Requirements for the Control of Electromagnetic Interference Characteristics of Replaceable Electronic Modules.

This standard is for use in the specification of electromagnetic performance requirements for replaceable electronic modules (REMs). This standard has been developed in response to changes in the technology used to implement functions and/or subsystems into larger, more complicated integrated systems. The architecture for complex systems and system platforms has evolved in recent years from a collective of stand-alone federated subsystems that each performs a set of functions to a highly integrated rack system that incorporate a backplane and multiple subordinate modules that perform the required functions. Some of the modules are designed for a particular purpose, such as power supply or power distribution, whereas others will provide maximum flexibility by being programmable to perform one or more functions. These modules have become items that are often procured independently from the system rack or frame in which they are designed to reside. For this reason, the module specification requirements have also had to mature to include not only descriptions of the functionality and interfaces required but also operational environment conditions. This standard addresses the module electromagnetic environments, by way of adaptation of the test requirements of MIL-STD-461E.[1] Since MIL-STD-461E is intended for use with electronic systems or subsystems, it is not appropriate to apply that standard directly to REMs. However, many of the environments simulated by MIL-STD-461E tests are relevant for REMs and have been used as the basis for the tests described in this standard.

Beneficial comments (recommendations, additions, and deletions) and any pertinent data that may be of use in improving this document should be addressed to: IEEE, Electromagnetic Compatibility (EMC) Society, Standards Development Committee, PAR-1688 Working Group.

The stated requirements are considered necessary to provide reasonable confidence that a particular REM that complies with these requirements will function within its designated design tolerances when within the electromagnetic operating environment of a designated rack, frame, enclosure, or modular system. The procuring activity should consider tailoring the individual requirements to be more or less severe based on the design features of the intended rack host and transmission in concert with personnel knowledgeable about electromagnetic compatibility issues affecting platform integration.

An annex is included that provides the rationale and background for each requirement and verification section.

A committee consisting of representatives of government and industry prepared this document under the IEEE EMC Society Standards Development Committee.

[1] Information on references can be found in Clause 2.

## Contents

1. Overview ..... 9
1.1 General ..... 9
1.2 Scope ..... 10
1.3 Purpose ..... 10
1.4 Structure ..... 10
1.5 Emission and susceptibility designations ..... 10

2. Normative references ..... 11

3. Definitions, acronyms, and abbreviations ..... 12
3.1 Definitions ..... 12
3.2 Acronyms and abbreviations ..... 12

4. General requirements ..... 13
4.1 General ..... 13
4.2 Interface requirements ..... 14
4.3 Verification requirements ..... 14
4.4 REM test configurations ..... 18

5. Detailed requirements ..... 24
5.1 General ..... 24
5.2 EMI control requirements versus intended installations ..... 25
5.3 Emission and susceptibility requirements, limits, and verification ..... 26
5.4 CE102M conducted emissions, power, control, and signal leads, 10 kHz to 10 MHz ..... 26
5.5 CS101M, conducted susceptibility, power supply REM leads, 30 Hz to 150 kHz ..... 33
5.6 CS103M conducted susceptibility, antenna port, intermodulation, 15 kHz to 10 GHz ..... 40
5.7 CS104M, conducted susceptibility, antenna port, rejection of undesired signals, 30 Hz to 20 GHz ..... 41
5.8 CS105M, conducted susceptibility, antenna port, cross-modulation, 30 Hz to 20 GHz ..... 41
5.9 CS106M, conducted susceptibility, transients, power leads ..... 42
5.10 CS114M conducted susceptibility, bulk cable injection, 10 kHz to 200 MHz ..... 47
5.11 CS115M, conducted susceptibility, bulk cable injection, impulse excitation ..... 56
5.12 CS116M, conducted susceptibility, damped sinusoidal transients, cables, and power leads, 10 kHz to 100 MHz ..... 61
5.13 RE101M, radiated emissions, magnetic field, 30 Hz to 100 kHz ..... 69
5.14 RE102M, radiated emissions, electric field, 10 kHz to 18 GHz ..... 72
5.15 RS101M, radiated susceptibility, magnetic field, 30 Hz to 100 kHz ..... 82
5.16 RS103M, radiated susceptibility, electric field, 30 mHz to 18 GHz ..... 90
5.17 RS107M, electrostatic discharge from human contact ..... 100

Annex A (informative) Replaceable Electronic Module Electromagnetic Interference Standard Application Guide ..... 103

# IEEE Standard Requirements for the Control of Electromagnetic Interference Characteristics of Replaceable Electronic Modules



## 1. Overview

### 1.1 General

This standard is for use in the specification of electromagnetic performance requirements for replaceable electronic modules (REMs). A REM is used in highly integrated rack systems that perform functions that heretofore were performed by a standalone equipment "box.. This standard provides the ability to control the electromagnetic interference (EMI) performance of a REM at the module level, giving the advantage of reducing risk associated with integrating with the host rack system. The requirements have matured to include not only descriptions of the functionality and interfaces required but also operational environment conditions. This standard addresses the module electromagnetic environments, by way of adaptation of the test requirements of MIL-STD-461E.[1] The standard includes general requirements, detailed requirements, verification methods, reporting requirements, and, most important, an informative application guide in the annex. In addition, this document is derived from public domain material and may be duplicated as required to develop test plans and procedures.

[1] Information on references can be found in Clause 2.